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The crustal structure in the transition from the on land fold-and-thrust belt to the offshore accretionary prism in the Taiwan arc-continent collision

Joaquina Alvarez-Marrón[1], Dennis Brown[1,2], Juan Alcalde[1], Ignacio Marzán[1], and Hao Kuo-Chen[2]
[1]ICTJA, CSIC, Earth Structure and Dynamics, Barcelona, Spain (jalvarez@ictja.csic.es)
[2]National Central University, Zhongli District, Taoyuan, Taiwan (kuochen@g.ncu.edu.tw)

The region of Taiwan is undergoing active, oblique arc-continent colision between the Luzon Arc on the Philippine Sea Plate and the continental margin of Eurasia. The Fold-and-Thrust Belt (FTB) in Taiwan passes southwards into a submarine accretionary wedge at the Manila subduction zone. The aim of this contribution is to examine how an on land FTB changes into a marine accretionary prism in the context of an oblique arc-continent collision. The Miocene pre-orogenic sediments of the continental margin are widespread in the FTB ca. 23° latitude while the offshore wedge is built up dominantly by Pliocene to recent syn-orogenic sediments. In the transition area from the marine accretionary wedge ca. 21° latitude to the on land FTB, the thrust wedge is climbing up the slope of the Eurasian continental margin. The deformation front is at sea floor depth of ca. 4 km in the south to less than 1 km as it reaches the coast line. Here we use the island surface geology, marine reflection seismic profiles, and seismic tomography models to construct contour maps of the basal thrust and the depth to the Moho across a transition area from near 23° to near 21° latitude. In this zone, the deformation front draws a convex curvature as the wedge widens from ca. 50 in the north and south, to more than 130 km near 22° latitude. The basal thrust surface shows a scoop shape as its dip changes from southeast near the coast line to east southward. The basal thrust reaches over 7 km deep beneath the rear of the FTB before ramping into de basement and merging into the Chaochou fault at 10 km depth. Offshore, it shows a gentler dip from 7 km to c. 10 km depth before getting steeper towards the east below the Hengchung Ridge. The basal cuts laterally along-strike through the margin's sedimentary cover to incorporate thicker Miocene pre-orogenic sediments onto its hanging wall as it passes from the offshore wedge to the on land FTB.

In the offshore area, the Moho (we use a Vp proxy of 7.5 km/s extracted from the seismic tomography) shallows southeastward, from near 25 km depth below the shelf slope break to less than 17 km depth below the offshore wedge near 21.5° latitude before it starts to deep east towards beneath the Taiwan coast. The Moho dips northeast from near 25 km depth below the coast near Kaohsiung, to near 40 depth below the rear of the FTB at 23.5°, latitude. This complex morphology of the Moho may be related to the changes in crustal thickness and the obliquity of the collision. Because of this, crustal thickening is less pronounced beneath southern Taiwan where the thinner part of the margin is colliding with the arc.

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